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LANL Tritium Supply and Demand Model

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Summary

The LANL Tritium Supply and Demand Model provides the capability to investigate the adequacy of future tritium supply subject to stockpile demand for various scenarios. The tool includes the ability to change stockpile demand factors and adjust tritium production plans, while accounting for Tritium decay. The model has been used numerous times to identify potential tritium shortfalls and advocate for changes to tritium production planning and implementation.

How the model works

The Tritium Supply and Demand Model is an Excel™-based model of tritium supply projection overlaid on the anticipated tritium demand budget for the US nuclear weapons enterprise. The tritium demand budget calculation includes the Production and Planning Directive (P&PD) gas fill and exchange values, lifetimes of limited life components (LLCs), future stockpile planning, logistical pipeline delays, required minimum inventory for tritium processing, and laboratory testing requirements. The tritium supply calculation includes the number of Tritium Producing Burnable Absorber Rods (TPBARs) planned to be loaded in each operating cycle for Tennessee Valley Authority's Watts Bar Units 1 and 2, anticipated grams of tritium produced per TPBAR, cooling and logistical delays, and extraction efficiency. A notional representation of tritium supply and demand budget is presented in Figure 1.

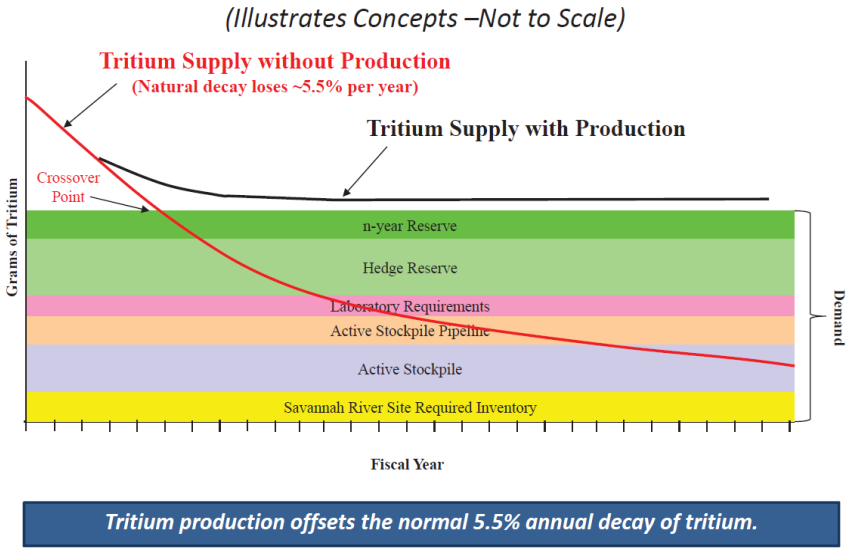

*Figure 1 Notional Tritium Supply & Demand**

*Reused from NNSA presentation to NRC, dated August 14, 2014, Docket # 05000390.

The graphic shows tritium supply curves (with and without production) overlaid on the demand budget. The demand budget is a layered composite of tritium needs for the active stockpile, active stockpile logistics (pipeline), laboratory testing requirements, required minimum inventory, as well as specified quantities for reserve. Tritium supply is expected to meet demand if the black curve stays above the layered composite. The model is used to investigate a range of demand and supply scenarios to proactively identify potential crossover points, as indicated in red in Figure 1.

The model in action

The LANL Tritium model has been reviewed by a partner laboratory and compares well to the NNSA Tritium model. The model is based on the P&PD and is periodically updated to the latest program data. Additional input to the model comes from NNSA, the Pacific Northwest National Laboratory TPBAR program and from gas transfer system design teams. The model has been used to evaluate stockpile and tritium production decisions, including the 2018 Nuclear Posture Review and 2018 JASON tritium program review.